

## What is Claimed:

- 1                   1.     A method of charging a battery having an internal  
2     resistance and an external resistance connected to the battery comprising the  
3     steps of:  
  
4                   applying electrical energy to the battery; and  
  
5                   adjusting, at each of a plurality of predetermined intervals, the  
6     electrical energy applied to the battery based on at least one of the internal  
7     resistance of the battery and the external resistance connected to the  
8     battery.
- 1                   2.     The method of claim 1 comprising the additional step of:  
  
2                   determining at least one of (a) the internal resistance of the  
3     battery, and (b) the external resistance connected to the battery.
- 1                   3.     The method of claim 1 comprising the additional step of:  
  
2                   determining a voltage drop associated with at least one of (a)  
3     the internal resistance of the battery, and (b) the external resistance  
4     connected to the battery.
- 1                   4.     The method of claim 3 wherein the determining step  
2     occurs when the battery is substantially neither charging nor discharging.
- 1                   5.     The method of claim 3 comprising the additional steps of:  
  
2                   (a) applying the electrical energy to the battery for a  
3     predetermined charging time period;  
  
4                   (b) applying a discharge pulse to the battery for a  
5     predetermined discharging time period;

6 (c) providing a predetermined rest period during which neither  
7 the electrical energy nor the discharge pulse is applied to the battery, and  
8 during which the determining step takes place; and

9 (d) repeating steps (a), (b), and (c).

1 6. The method of claim 3 wherein a protective device is  
2 connected to the battery and the determining step includes determining a  
3 voltage drop across the protective device.

1 7. The method of claim 3 wherein the battery is comprised of  
2 at least one of a terminal resistance and a lead resistance and the  
3 determining step includes determining a voltage drop across at least one of  
4 the terminal resistance and the lead resistance.

1 8. The method of claim 1 having a charging period and a  
2 non-charging period comprising the additional steps of:

3 (a) measuring the voltage of the battery during the non-  
4 charging period; and

5 (b) measuring the voltage of the battery during the charging  
6 period,

7 the electrical energy being adjusted during the adjusting step  
8 based on a difference between the voltage measured during step (a) and the  
9 voltage measured during step (b).

1 9. The method of claim 1 having a charging period and a  
2 non-charging period comprising the additional steps of:

3 (a) determining if the battery voltage during the non-charging  
4 period is greater than or equal to a predetermined threshold voltage level;  
5 and

6 (b) terminating a constant current portion of a charging cycle if  
7 the battery voltage during the non-charging period is greater than or equal to  
8 the threshold voltage level.

1 10. The method of claim 1 comprising the additional steps of:

2 (a) determining if a charging current being applied to the battery  
3 is greater than a predetermined current level during a constant current phase  
4 of a charging cycle of the battery;

5 (b) decreasing the charging current if it is determined to be  
6 above the predetermined current level; and

7 (c) increasing the charging current if it is determined to be below  
8 the predetermined current level.

1 11. The method of claim 1 comprising the additional steps of:

2 (a) determining if a charging current being applied to the battery  
3 is below a predetermined current level during a constant voltage phase of a  
4 charging cycle of the battery; and

5 (b) terminating the constant voltage phase of the charging cycle  
6 if the charging current being applied to the battery is below the  
7 predetermined current level.

1 12. The method of claim 1 wherein the adjusting step includes  
2 adjusting the duration of a pulse of the electrical energy applied to the  
3 battery.

1 13. A computer readable carrier including computer program  
2 instructions for implementing a method of charging a battery having an  
3 internal resistance and an external resistance connected to the battery, the  
4 method comprising the steps of:

5                   applying electrical energy to the battery; and

6                   adjusting, at each of a plurality of predetermined intervals, the  
7   electrical energy applied to the battery based on at least one of the internal  
8   resistance of the battery and the external resistance connected to the  
9   battery.

1                   14.   The computer reader carrier of claim 13 wherein the  
2   method comprises the additional step of determining a voltage drop  
3   associated with at least one of (a) the internal resistance of the battery, and  
4   (b) the external resistance connected to the battery.

1                   15.   The computer reader carrier of claim 14 wherein the  
2   method comprises the additional steps of:

3                   (a) applying the electrical energy to the battery for a  
4   predetermined charging time period;

5                   (b) applying a discharge pulse to the battery for a  
6   predetermined discharging time period;

7                   (c) providing a predetermined rest period during which neither  
8   the electrical energy nor the discharge pulse is applied to the battery, and  
9   during which the determining step takes place; and

10                  (d) repeating steps (a), (b), and (c).

1                   16.   The computer reader carrier of claim 13 wherein the  
2   method comprises the additional steps of:

3                   (a) measuring the voltage of the battery during a non-charging  
4   period; and

5                   (b) measuring the voltage of the battery during a charging  
6   period,

7                   the electrical energy being adjusted during the adjusting step  
8   based on a difference between the voltage measured during step (a) and the  
9   voltage measured during step (b).

1                   17.   An electronic device comprising:

2                   a battery having an internal resistance and an external  
3   resistance connected to the battery; and

4                   a computer readable carrier including computer program  
5   instructions for implementing a method of charging the battery, the method  
6   comprising the steps of:

7                   applying electrical energy to the battery; and

8                   adjusting, at each of a plurality of predetermined intervals, the  
9   electrical energy applied to the battery based on at least one of the internal  
10   resistance of the battery and the external resistance connected to the  
11   battery.

1                   18.   The electronic device of claim 17 wherein the method  
2   comprises the additional step of determining a voltage drop associated with  
3   at least one of (a) the internal resistance of the battery, and (b) the external  
4   resistance connected to the battery.

1                   19.   The electronic device of claim 18 wherein the method  
2   comprises the additional steps of:

3                   (a) applying the electrical energy to the battery for a  
4   predetermined charging time period;

5                   (b) applying a discharge pulse to the battery for a  
6   predetermined discharging time period;

7 (c) providing a predetermined rest period during which neither  
8 the electrical energy nor the discharge pulse is applied to the battery, and  
9 during which the determining step takes place; and

10 (d) repeating steps (a), (b), and (c).

1 20. The electronic device of claim 17 wherein the method  
2 comprises the additional steps of:

3 (a) measuring the voltage of the battery during a non-charging  
4 period; and

5 (b) measuring the voltage of the battery during a charging  
6 period,

7 the electrical energy being adjusted during the adjusting step  
8 based on a difference between the voltage measured during step (a) and the  
9 voltage measured during step (b).

1 21. An electronic device comprising:

2 a battery having an internal resistance and an external  
3 resistance connected to the battery; and

4 a processor, the processor controlling an electrical energy source  
5 for applying electrical energy to the battery, and

6 the processor adjusting, after each of a plurality of  
7 predetermined intervals, the electrical energy applied to the battery based on  
8 at least one of the internal resistance of the battery and the external  
9 resistance connected to the battery.

1 22. The electronic device of claim 21 wherein the method  
2 comprises the additional step of determining a voltage drop associated with

3 at least one of (a) the internal resistance of the battery, and (b) the external  
4 resistance connected to the battery.

1 23. The electronic device of claim 22 wherein the method  
2 comprises the additional steps of:

3 (a) applying the electrical energy to the battery for a  
4 predetermined charging time period;

5 (b) applying a discharge pulse to the battery for a  
6 predetermined discharging time period;

7 (c) providing a predetermined rest period during which neither  
8 the electrical energy nor the discharge pulse is applied to the battery, and  
9 during which the determining step takes place; and

10 (d) repeating steps (a), (b), and (c).

1 24. The electronic device of claim 21 wherein the method  
2 comprises the additional steps of:

3 (a) measuring the voltage of the battery during a non-charging  
4 period; and

5 (b) measuring the voltage of the battery during a charging  
6 period,

7 the electrical energy being adjusted during the adjusting step  
8 based on a difference between the voltage measured during step (a) and the  
9 voltage measured during step (b).